# Supplemental material

# Late spring bloom development of pelagic diatoms in Baffin Bay

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**Table S1: Linear measurements, biovolume, and carbon biomass[a] of the taxa observed in Baffin Bay**

| Genus and species | n | D (µm) | PA (µm) | AA (µm) | TA (µm) | Shape | Mean volume (µm$^3$) | Mean carbon biomass (pg cell$^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| *Attheya* spp. | 20 | -[b] | 4.3–22.4 [10.7] | 3.5–12.2 [6.2] | 2.8–9.7 [5.0] | Elliptical cylinder | 236 | 28 |
| *Bacterosira bathyomphala* | 12 | 19.5–22.8 [21.0] | 11.6–27.3 [16.9] | - | - | Cylinder | 5,959 | 329 |
| *C. decipiens* | 18 | - | 16.8–36.2 [23.6] | 18.3–70.5 [39.6] | 14.1–54.3 [30.5] | Elliptical cylinder | 24,836 | 973 |
| *C. gelidus (C. socialis)* | 18 | - | 4.6–13.7 [8.8] | 4.2–10.5 [6.0] | 2.1–5.3 [3.0] | Elliptical cylinder | 123 | 17 |
| *Eucampia groenlandica* | 19 | - | 25.5–70.9 [40.4] | 10.9–15.6 [13.3] | 4.4–6.2 [5.3] | Elliptical cylinder | 2,269 | 158 |
| *Leptocylindrus danicus* | 4 | 7.8–11.0 [8.8] | 58.2–62.3 [60.8] | - | - | Cylinder | 3,792 | 233 |
| *Melosira arctica* (cell + spore) | 22 | 18.7–26.5 [22.0] | 18.6–29.8 [25.0] | - | - | Cylinder | 9,839 | 482 |
| *Porosira glacialis* | 7 | 32.4–52.9 [44.2] | 12.6–30.6 [20.9] | - | - | Cylinder | 33,298 | 1,216 |
| *Rhizosolenia hebetata var. hebetata/semispina* | 3 | 13.5–21.3 [18.4] | 589.0–850.0 [727.5] | - | - | Cylinder | 210,852 | 4,946 |
| *Thalassiosira anguste-lineata* | 11 | 32.7–45.6 [39.4] | 13.3–24.8 [19.0] | - | - | Cylinder | 24,176 | 954 |
| *T. antarctica var. borealis* (spore)[c] | 10 | - | - | - | - | Cylinder | 7,067 | 374 |
| *T. antarctica var. borealis/gravida* (cell) | 20 | 16.0–42.0 [29.7] | 14.9–29.1 [19.8] | - | - | Cylinder | 14,722 | 654 |
| *T. hyalina* | 11 | 29.5–46.3 [39.7] | 11.9–17.5 [15.1] | - | - | Cylinder | 19,397 | 807 |
| *T. nordenskioeldii* | 22 | 15.3–19.9 [19.8] | 12.2–22.4 [16.0] | - | - | Cylinder | 5,062 | 291 |
| *Pauliella taeniata* | 41 | - | 6.0–13.8 [9.1] | 16.8–40.0 [28.3] | 4.9–11.6 [8.2] | Elliptical cylinder | 1,709 | 127 |
| *Ceratoneis closterium* | 60 | 2.1–5.8 [3.7] | 52.3–221.0 [96.6] | - | - | Spindle | 671 | 63 |
| *Entomoneis* spp. | 7 | - | 17.5–41.7 [28.1] | 49.2–182.6 [91.9] | 9.8–36.5 [18.4] | Elliptical cylinder | 53,535 | 1,745 |
| *Fossula arctica* | 23 | - | 5.0–9.0 [7.0] | 11.0–29.0 [16.9] | 2.3–6.1 [3.6] | Elliptical cylinder | 355 | 39 |
| *Fragilariopsis cylindrus* | 41 | - | 1.0–5.0 [2.2] | 4.0–42.0 [10.8] | 1.0–5.0 [2.2] | Cuboid x 0.9 | 75 | 12 |
| *F. oceanica* | 24 | - | 3.3–8.0 [4.8] | 12.0–29.0 [18.6] | 2.8–8.0 [4.4] | Elliptical cylinder | 346 | 38 |
| *Fragilariopsis* spp. (10-20) | 18 | - | 3.9–8.2 [6.5] | 10.3–20.0 [15.3] | 2.6–5.0 [3.8] | Elliptical cylinder | 325 | 36 |
| *Fragilariopsis* spp. (> 50) | 18 | - | 3.5–6.6 [5.6] | 21.9–57.8 [41.3] | 5.4–14.3 [10.3] | Elliptical cylinder | 2,034 | 145 |
| *Gyrosigma / Pleurosigma* spp. | 19 | - | 10.2–29.9 [20.8] | 87.7–183.0 [131] | 10.2–29.9 [20.8] | Elliptical cylinder | 46,894 | 1,578 |
| *Membraneis* spp. | 4 | - | 33.7–37.8 [36.2] | 66.9–82 [73.3] | 22.3–27.3 [24.4] | Elliptical cylinder | 51,014 | 1,682 |
| *Navicula septentrionalis* | 20 | - | 5.9–10.9 [9.1] | 21.1–30.2 [28.1] | 5.9–10.9 [9.1] | Elliptical cylinder | 1,919 | 139 |
| *N. vanhoeffenii* | 19 | - | 6.4–16.5 [9.4] | 29.8–64.7 [48.3] | 6.4–16.5 [9.4] | Lanceolate cylinder x 0.85 | 2,696 | 180 |
| *Navicula* spp. (20-50) | 17 | - | 4.0–10.3 [7.6] | 22.1–48.2 [36.5] | 4.7–12.1 [8.9] | Elliptical cylinder | 2,239 | 156 |
| *Navicula* spp. (>50) | 26 | - | 5.9–19.9 [11.1] | 51.8–86.0 [62.7] | 6.9–23.4 [13.0] | Elliptical cylinder | 7,947 | 409 |
| *Nitzschia frigida* | 46 | - | 3.8–9.6 [6.5] | 44.9–93 [61.0] | 7.6–19.2 [13.1] | Lanceolate cylinder | 3,631 | 226 |
| *N. promare* | 10 | - | 4.4–6.3 [5.3] | 36.1–44.9 [40.6] | 8.8–12.6 [10.6] | Prism on parallelogram-base x 1.15 | 1,361 | 107 |
| *Nitzschia* spp. (>50) | 15 | - | 2.7–11.7 [5.8] | 61.5–205.0 [113.5] | 5.3–23.4 [11.7] | Prism on parallelogram-base x 1.15 | 6,316 | 344 |
| *Plagiotropis* spp. | 7 | - | 10.6–23.2 [19.1] | 38.3–68.9 [58.9] | 10.6–19 [16.3] | Prism on parallelogram-base x 1.15 | 11,377 | 538 |
| *Pseudo-nitzschia delicatissima* | 55 | - | 1.3–3.4 [2.0] | 40.1–86.0 [73.4] | 1.8–4.5 [2.7] | Prism on parallelogram-base x 0.7 | 144 | 19 |
| *Pseudo-nitzschia seriata* | 48 | - | 2.3–5.9 [3.9] | 48.5–87.4 [65.7] | 3.0–7.8 [5.2] | Prism on parallelogram-base x 0.7 | 495 | 50 |
| *Synedropsis hyperborea* | 23 | - | 1.5–4.6 [2.8] | 22.4–68.5 [44.1] | 1.9–5.9[3.6] | Elliptical cylinder | 376 | 40 |

[a] Range and mean (in brackets) are indicated together for the linear measurements**.** Shapes were used to estimate a mean volume from linear dimensions. The carbon biomass was estimated from the mean volume of each taxon, where n = number of observations, D = diameter, PA = pervalvar axis, AA = apical axis, and TA = transapical axis.
[b] The absence of measurements is due to the shape of the cell (e.g., for cylindrical cells, only D and PA are necessary to calculate the biovolume, whereas for elliptical cylinders three measurements are needed).
[c] Because *Thalassiosira antarctica var. borealis* resting spores were usually observed within the cell, the ratio between the surface of the spore and the surface of the cell was measured to derive the biovolume of the spores ($S_{spore}$ = 0.48 x $S_{cell}$; n = 10).

**Table S2: Functional trait data[a] for the taxa observed in Baffin Bay**

| Taxa | Quantitative trait | | | Binary trait[b] | | Continuous trait (from 0 to 1)[b] | | |
|---|---|---|---|---|---|---|---|---|
| | ESD[c] | S/V[c] | $T_{opt}$[d] | IBP[d] | Spikes | Silicified | Spores | Colonies |
| *Attheya septentrionalis/A. longicornis* | 8 | 1.00 | 2.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.5 |
| *Bacterosira bathyomphala* | 22 | 0.30 | 4.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| *Chaetoceros gelidus* | 6 | 1.24 | 8.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 |
| *Chaetoceros decipiens* | 36 | 0.18 | 14.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| *Ceratoneis closterium* | 11 | 0.83 | 9.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.0 |
| *Eucampia groelandica* | 16 | 0.57 | 4.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| *Fragilariopsis cylindrus* | 5 | 1.26 | 5.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| *F. oceanica* | 9 | 0.85 | 5.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| *Fossula arctica* | 9 | 0.90 | 5.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| *Leptocylindrus danicus* | 19 | 0.48 | 28.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.50 |
| *Navicula vanhoeffenii* | 17 | 0.58 | 4.00 | 0.00 | 0.00 | 0.50 | 0.00 | 1.00 |
| *N. septentrionalis* | 15 | 0.49 | 4.00 | 0.00 | 0.00 | 0.50 | 1.00 | 1.00 |
| *Pauliella taeniata* | 15 | 0.52 | 4.00 | 0.00 | 0.00 | 0.50 | 1.00 | 1.00 |
| *Nitzschia frigida* | 19 | 0.25 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| *Pseudo-nitzschia* seriata | 10 | 0.57 | 23.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| *P. delicatissima* | 7 | 1.14 | 23.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| *Rhizosolenia hebetata* f. *semispina* | 74 | 0.20 | 10.00 | 0.00 | 1.00 | 1.00 | 0.50 | 0.50 |
| *Thalassiosira antarctica var. borealis* | 30 | 0.22 | 13.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *T. nordenskioeldii* | 21 | 0.32 | 13.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *T. hyalina* | 33 | 0.22 | 2.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *Melosira arctica* | 27 | 0.25 | 5.00[e] | 1.00[f] | 0.00 | 1.00 | 1.00 | 1.00 |

[a] Abbreviations refer to equivalent spherical diameter (ESD), surface area to volume ratio (S/V), optimal temperature for growth ($T_{opt}$), and ability to produce ice-binding proteins (IBP). 'Spikes' refers to the presence or absence of long, sharp projections such as setae, spines, horns and cellular processes. 'Silicified' refers to the degree of silicification, qualitatively based on examination of SEM images. 'Spores' refers to the propensity to form resting spores. 'Colonial' refers to the ability to form colonies.
[b] Binary and continuous traits were coded using a 'fuzzy code' (Chevene et al., 1994), which allows species to exhibit a trait to a certain degree. Continuous traits were arbitrarily scaled to a value between 0 and 1 (i.e., lowest (= 0), intermediate (0.5), and highest (= 1) probability of species having that trait.
[c] ESD and S/V data come from this study. Other trait data were retrieved from Fragoso et al. (2018) who conducted an extensive literature search for ecological strategies, life history and morphological traits of diatom species. Details about the traits and how they are encoded can also be found in Fragoso et al. (2018). We added the species *Melosira arctica* (see the bibliography below) which was observed in our study, but not in Fragoso et al. (2018).
[d] As it was difficult to find information for the traits $T_{opt}$ and IBP for every species, some species were grouped based on trait similarities (i.e., cell morphology; e.g., *Thalassiosira antarctica var. borealis* and *T. nordenskioeldii* are both highly silicified, form colonies, share similar shape, and produce resting spores), and one single value for $T_{opt}$ and IBP was given to the species belonging to the same group.
[e] The optimal temperature for *Melosira arctica* growth was found in Spilling and Markager (2008).
[f] The ability of *Melosira arctica* to produce ice-binding proteins was highlighted by Krembs et al. (2011).

## Table S3: Summary of the environmental and biological data at the 29 stations

| Metadata | | | | | | | Environmental data[a] | | | | | | | | | | | Biological data[b] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Longitude | Latitude | Date of sampling (year-month-day) | Depth of the SCM (m) | DOW50 (d) | SIC | hBD (m) | Ze (m) | ANP (%) | ∫[$NO_3^-$] (mmol $m^{-2}$) | ∫[$H_4SiO_4$] (mmol $m^{-2}$) | ∫[$PO_4^{3-}$] (mmol $m^{-2}$) | ∫Chl *a* (mg $m^{-2}$) | ∫BSi (mmol $m^{-2}$) | ∫Chl *c3* (mg $m^{-2}$) | ∫Phaeo a (mg $m^{-2}$) | ∫ρSi (mmol $m^{-2}$ $d^{-1}$) | ∫ VSi ($d^{-1}$) | Abundance (cells $L^{-1}$) | | C Biomass (µg C $L^{-1}$) | |
| | | | | | | | | | | | | | | | | | | | Surface | SCM | Surface | SCM |
| 100 | –56.79 | 68.499 | 2016-06-09 | 40 | 15 | 0.00 | 29 | 41 | 11.8 | 0.0 | 17.6 | 2.1 | 34.7 | 32.7 | 5.0 | 8.0 | 0.6 | 1.5 | 33,800 | 34,480 | 5.4 | 9.4 |
| 102 | –57.48 | 68.497 | 2016-06-10 | 40 | 15 | 0.00 | 41 | 33 | 7.2 | 4.0 | 42.1 | 5.0 | 90.2 | 45.6 | 11.1 | 14.3 | 0.3 | 0.6 | - | 47,960 | - | 16.7 |
| 107 | –59.18 | 68.498 | 2016-06-11 | -[c] | –15 | 0.97 | 21 | 13 | 9.6 | 50.2 | 85.7 | 7.6 | 63.3 | 16.3 | 3.8 | 3.8 | 1.2 | 5.1 | - | - | - | - |
| 110 | –60.17 | 68.534 | 2016-06-12 | - | –23 | 1.00 | 26 | 21 | 20.7 | 145.1 | 137.0 | 17.4 | 29.7 | 15.4 | 2.2 | 1.7 | 0.7 | 3.3 | - | - | - | - |
| 115 | –61.36 | 68.456 | 2016-06-13 | 30 | –20 | 0.93 | 24 | 31 | 63.0 | 103.6 | 244.5 | 22.5 | 12.9 | 10.3 | 1.3 | 1.0 | 0.4 | 3.4 | 24,696 | 1-764 | 1.4 | 0.5 |
| 201 | –59.95 | 68.633 | 2016-06-14 | 40 | –18 | 0.98 | 26 | 31 | 21.0 | 151.7 | 151.9 | 17.6 | 34.7 | 20.5 | 3.0 | 1.5 | 0.6 | 2.3 | 19,656 | 13,356 | 3.7 | 1.5 |
| 204 | –59.26 | 68.708 | 2016-06-15 | 15 | –12 | 0.93 | 18 | 22.5 | 10.7 | 25.2 | 31.9 | 4.8 | 66.9 | 35.4 | 3.6 | 6.0 | 1.9 | 2.1 | 915,594 | 463,680 | 93.6 | 122.7 |
| 207 | –58.53 | 68.794 | 2016-06-16 | 15 | 6 | 0.41 | 14 | 22.5 | 1.6 | 0.8 | 23.1 | 1.7 | 77.3 | 61.2 | 6.3 | 6.2 | 1.7 | 1.5 | 78,627 | 119,448 | 26.5 | 55.5 |
| 300 | –56.79 | 68.999 | 2016-06-17 | 44 | 31 | 0.00 | 38 | - | 9.4 | 7.5 | 35.2 | 5.1 | 100.7 | 58.4 | 17.4 | 12.2 | 2.0 | 3.2 | 16,128 | 34,776 | 6.8 | 9.3 |
| 309 | –58.74 | 69.000 | 2016-06-18 | 15 | 2 | 0.00 | 19 | 29.5 | 2.2 | 1.7 | 19.0 | 1.3 | 73.6 | 63.4 | 3.4 | 5.1 | 3.0 | 2.1 | 256,536 | 429,015 | 36.2 | 56.5 |
| 312 | –59.56 | 69.012 | 2016-06-19 | 15 | –8 | 1.00 | 18 | 15.8 | 17.7 | 49.3 | 72.7 | 8.3 | 44.3 | 32.3 | 3.7 | 4.3 | 2.2 | 3.8 | 18,900 | 86,436 | 3.4 | 16.5 |
| 318 | –60.95 | 69.007 | 2016-06-20 | - | –6 | 0.99 | 21 | 27.5 | 24.4 | 110.0 | 111.3 | 14.1 | 29.5 | 18.4 | 3.0 | 1.5 | 0.5 | 2.2 | 8,920 | - | 1.2 | - |
| 324 | –62.36 | 68.996 | 2016-06-21 | 20 | –20 | 1.00 | 25 | 21.5 | 41.6 | 95.8 | 178.5 | 19.1 | 38.3 | 15.4 | 2.9 | 1.6 | 0.7 | 3.5 | 48,132 | 27,468 | 5.7 | 2.9 |
| 403 | –61.60 | 68.031 | 2016-06-25 | - | –17 | 0.86 | 26 | 40.5 | 44.3 | 139.3 | 222.2 | 22.6 | 5.5 | 7.9 | 0.4 | 0.7 | 0.3 | 3.5 | 18,680 | - | 1.2 | - |
| 405 | –61.08 | 68.094 | 2016-06-26 | - | –9 | 1.00 | 21 | - | 44.3 | 89.9 | 176.1 | 16.7 | - | 11.5 | - | - | - | - | - | - | - | - |
| 409 | –59.99 | 68.106 | 2016-06-26 | - | –14 | 1.00 | 15 | 27 | 17.2 | 42.0 | 87.3 | 9.8 | 43.2 | 17.4 | 3.2 | 1.9 | 1.1 | 4.5 | 30,000 | - | 4.2 | - |
| 413 | –58.97 | 68.123 | 2016-06-27 | 30 | –2 | 0.77 | 21 | - | 9.3 | 28.9 | 51.3 | 6.4 | 30.9 | 30.6 | 2.0 | 11.6 | - | - | 21,672 | 18,900 | 7.1 | 2.5 |
| 418 | –57.77 | 68.114 | 2016-06-28 | 30 | 23 | 0.00 | 18 | 43 | 2.9 | 0.8 | 12.3 | 2.0 | 21.4 | 25.8 | 1.6 | 4.5 | 0.8 | 3.7 | 1,008 | 1,764 | 0.1 | 0.1 |
| 507 | –59.12 | 70.009 | 2016-06-30 | 12 | 8 | 0.00 | 15 | 20 | 10.2 | 3.8 | 6.3 | 3.1 | 100.5 | 74.6 | 1.4 | 18.9 | 2.4 | 1.8 | 623,952 | 610,344 | 149.0 | 210.0 |
| 512 | –60.36 | 70.003 | 2016-07-01 | 15 | 3 | 0.00 | 11 | 21 | 4.3 | 2.7 | 7.0 | 1.0 | 127.4 | 79.6 | 16.9 | 5.5 | 1.9 | 1.4 | 204,624 | 483,840 | 70.3 | 135.7 |
| 519 | –62.42 | 70.017 | 2016-07-02 | - | –2 | 0.84 | 14 | 34.5 | 25.8 | 61.3 | 108.8 | 8.8 | 14.2 | 9.7 | 0.9 | 1.5 | - | - | - | - | - | - |
| 600 | –63.99 | 70.511 | 2016-07-03 | - | –10 | 0.91 | 21 | 28 | 45.3 | 46.6 | 149.8 | 13.0 | 36.3 | 17.3 | 2.6 | 2.5 | - | - | 61,680 | - | 8.0 | - |
| 605 | –62.52 | 70.503 | 2016-07-04 | 20 | 0 | 0.17 | 17 | 41.5 | 24.5 | 37.7 | 124.4 | 9.6 | 28.9 | 13.6 | 1.5 | 1.5 | - | - | 30,492 | 43,848 | 5.9 | 2.4 |
| 615 | –59.52 | 70.499 | 2016-07-05 | 30 | 12 | 0.00 | 16 | 30.5 | 11.0 | 0.0 | 20.2 | 1.6 | 164.4 | 27.2 | 35.5 | 5.9 | 1.4 | 3.8 | 8,064 | 30,744 | 2.4 | 10.3 |
| 604.5 | –62.63 | 70.502 | 2016-07-06 | - | 2 | 0.00 | 15 | 44.5 | 40.3 | 21.2 | 84.9 | 8.2 | 26.4 | 15.2 | 1.0 | 2.0 | 0.4 | 2.1 | - | - | - | - |
| 703 | –58.72 | 69.500 | 2016-07-07 | 35 | 23 | 0.00 | 18 | 52 | 9.0 | 61.4 | 47.4 | 7.6 | 36.7 | 29.7 | 2.2 | 2.5 | - | - | 18,396 | 10,584 | 10.5 | 1.3 |
| 707 | –59.80 | 69.512 | 2016-07-08 | 35 | 10 | 0.00 | 16 | 32.5 | 20.2 | 0.7 | 9.6 | 3.1 | 71.9 | 40.6 | 7.1 | 4.4 | - | - | 184,968 | 39,312 | 25.3 | 2.6 |
| 713 | –61.58 | 69.501 | 2016-07-09 | 20 | 6 | 0.00 | 15 | 30.5 | 27.5 | 3.2 | 36.0 | 4.4 | 40.2 | 20.9 | 4.1 | 1.7 | - | - | 13,608 | 7,812 | 1.6 | 0.4 |
| 719 | –63.23 | 69.501 | 2016-07-10 | 21 | –2 | 0.60 | 16 | 26 | 50.8 | 31.6 | 129.4 | 10.4 | 48.0 | 15.0 | 2.1 | 2.5 | 0.8 | 3.5 | 27,216 | 105,840 | 5.7 | 9.5 |

[a] Nutrients were integrated down to the depth of the equivalent mixed layer hBD.

[b] Pigments and BSi data were integrated down to 80 m, because at that depth, almost all Chl *a* profiles were sufficiently close to 0, indicating that no significant biomass was missed.; ρSi and VSi were integrated down to the depth at which 0.1 % of the surface PAR remained.

[c] Data not presentable or not available. The depth of the SCM is only shown for the stations where diatoms were counted at the depth of the subsurface chlorophyll *a* maximum. ρSi, and VSi were not measured at all of the 29 stations, explaining the missing data.

**Table S4: Diatoms observed in Baffin Bay during the Green Edge expedition**

| Taxonomy (size) | | Cell abundance (cells $L^{-1}$) | | Occurrence (%)[a] |
|---|---|---|---|---|
| | | Mean | Maximum | |
| Centric | *Attheya longicornis* | 2,761 | 35,784 | 63 |
| | *A. septentrionalis* | 239 | 1,983 | 35 |
| | *Bacterosira bathyomphala* | 99 | 1,640 | 12 |
| | *Chaetoceros atlanticus* | 6 | 273 | 2 |
| | *C. borealis* | 92 | 3,024 | 5 |
| | *C. concavicornis* | 82 | 3,528 | 2 |
| | *C. cf. debilis* | 3,198 | 76,104 | 19 |
| | *C. decipiens* | 1,916 | 20,870 | 47 |
| | *C. gelidus* | 42,013 | 526,742 | 40 |
| | *Chaetoceros spp. (< 10 µm)* | 601 | 9,480 | 14 |
| | *Chaetoceros spp. (10–20 µm)* | 372 | 5,544 | 23 |
| | *Chaetoceros spp. (20–50 µm)* | 534 | 5,544 | 33 |
| | *Chaetoceros spp. (hypnospores)* | 6 | 252 | 2 |
| | *Coscinodiscus cf centralis* | 12 | 504 | 2 |
| | *cf. Dactyliosolen spp.* | 29 | 1,260 | 2 |
| | *Eucampia groenlandica* | 1,085 | 8,568 | 35 |
| | *Leptocylindrus danicus* | 316 | 10,584 | 9 |
| | *Melosira arctica* | 441 | 5,040 | 16 |
| | *M. arctica spores* | 5,060 | 124,488 | 33 |
| | *Porosira glacialis* | 136 | 2,016 | 21 |
| | *Rhizosolenia hebetata var. hebetata* | 6 | 252 | 2 |
| | *R. hebetata var. semispina* | 24 | 504 | 12 |
| | *Skeletonema costatum-like species* | 59 | 2,520 | 2 |
| | *Thalassiosira anguste-lineata* | 107 | 1,640 | 12 |
| | *T. antarctica var. borealis (spores)* | 106 | 3,024 | 9 |
| | *T. bioculata (cells + spores)* | 35 | 504 | 9 |
| | *T. antarctica var. borealis/gravida* | 7,721 | 68,040 | 51 |
| | *T. hyalina* | 581 | 9,576 | 16 |
| | *T. nordenskioeldii* | 2,216 | 18,574 | 37 |
| | *Thalassiosira spp. (5–10 µm)* | 23 | 756 | 5 |
| | *Thalassiosira spp. (10–20 µm)* | 1,130 | 12,096 | 56 |
| | *Thalassiosira spp. (20–50 µm)* | 4,330 | 58,968 | 74 |
| | *Thalassiosira spp. (> 50 µm)* | 583 | 9,576 | 42 |
| | *Centric diatom spp. (2–10 µm)* | 211 | 5,600 | 9 |
| | *Centric diatom spp. (10–20 µm)* | 129 | 2,520 | 21 |
| | *Centric diatom spp. (20–50 µm)* | 288 | 2,016 | 35 |
| | *Centric diatom spp. (> 50 µm)* | 32 | 522 | 12 |
| Pennate | *Pauliella taeniata* | 199 | 7,560 | 5 |
| | *Ceratoneis closterium* | 7,051 | 75,096 | 95 |
| | *Entomoneis spp.* | 216 | 4,040 | 26 |
| | *Fossula arctica* | 1,979 | 41,832 | 16 |
| | *Fragilariopsis cylindrus* | 637 | 15,876 | 21 |
| | *F. oceanica (cells)* | 2,877 | 65,520 | 14 |
| | *F. oceanica (spores)* | 680 | 29,232 | 2 |
| | *Fragilariopsis spp. (10–20 µm)* | 8,553 | 231,861 | 35 |
| | *Fragilariopsis spp. (20–50 µm)* | 2,058 | 30,720 | 28 |
| | *Gyrosigma/Pleurosigma spp.* | 30 | 504 | 14 |
| | *Licmophora spp.* | 12 | 504 | 2 |
| | *Membraneis spp.* | 8 | 120 | 9 |
| | *Navicula pelagica* | 61 | 1,855 | 5 |
| | *N. septentrionalis* | 798 | 14,112 | 14 |
| | *N. vanhoeffenii* | 49 | 1,600 | 5 |
| | *Navicula spp. (20–50 µm)* | 725 | 8,064 | 42 |
| | *Navicula spp. (> 50 µm)* | 204 | 2,520 | 30 |
| | *Nitzschia frigida* | 1,993 | 30,744 | 30 |
| | *N. promare* | 55 | 1,080 | 9 |
| | *Nitzschia spp. (20–50 µm)* | 19 | 504 | 7 |
| | *Nitzschia spp. (> 50 µm)* | 28 | 252 | 21 |
| | *Pseudogomphonema arcticum*[b] | -[b] | - | - |
| | *Pseudo-nitzschia delicatissima* | 6,645 | 83,160 | 91 |
| | *Pseudo-nitzschia seriata* | 299 | 2,920 | 26 |
| | *Synedropsis hyperborea* | 321 | 5,200 | 21 |
| | *Thalassionema nitzschioides* | 4 | 120 | 5 |
| | *Pennate diatom spp. (10–20 µm)* | 3,305 | 45,864 | 70 |
| | *Pennate diatom spp. (20–50 µm)* | 3,128 | 17,136 | 91 |
| | *Pennate diatom spp. (> 50 µm)* | 926 | 7,056 | 53 |

[a] Percent of all samples in which the taxon occurred
[b] Observed by scanning electron microscopy only

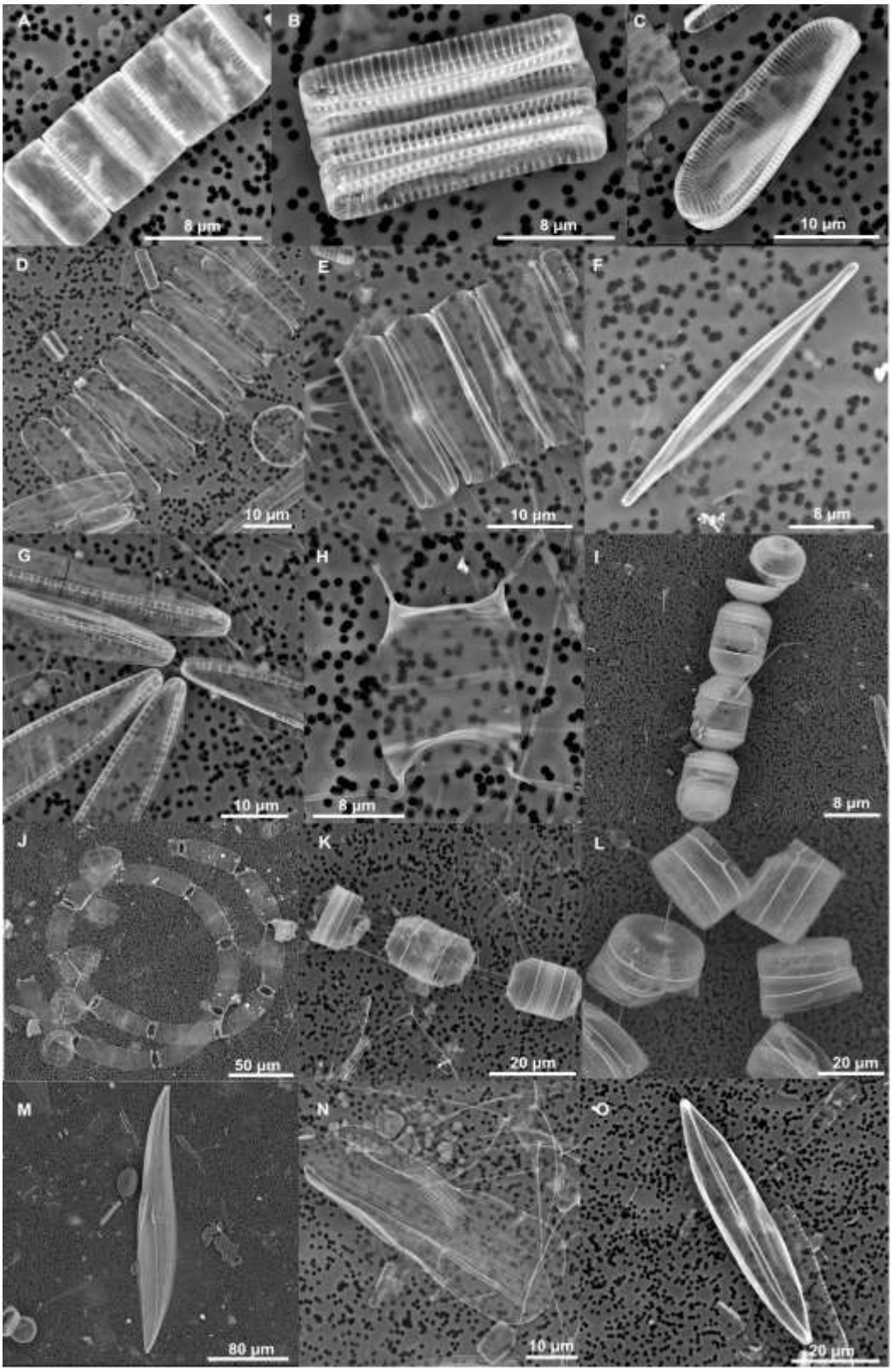


Figure S1. Selection of diatom species observed by scanning electron microscop**y**

Three samples (from stations 409, 507, and 600) were examined by scanning electron microscopy to help identify the diversity of species prior to counting under a light microscope: (A) *Fossula arctica*, (B) *Fragilariopsis cylindrus*, (C) *Fragilariopsis oceanica*, (D) *Navicula vanhoeffenii*, (E) *Pauliella taeniata*, (F) *Synedropsis hyperborea*, (G) *Nitzschia frigida*, (H) *Chaetoceros gelidus*, (I) *Melosira arctica*, (J) *Eucampia groenlandica*, (K) *Thalassiosira nordenskioeldii*, (L) *Thalassiosira antarctica var. borealis*, (M) *Pleurosigma* sp., (N) *Entomoneis* sp., and (O) *Navicula* sp.

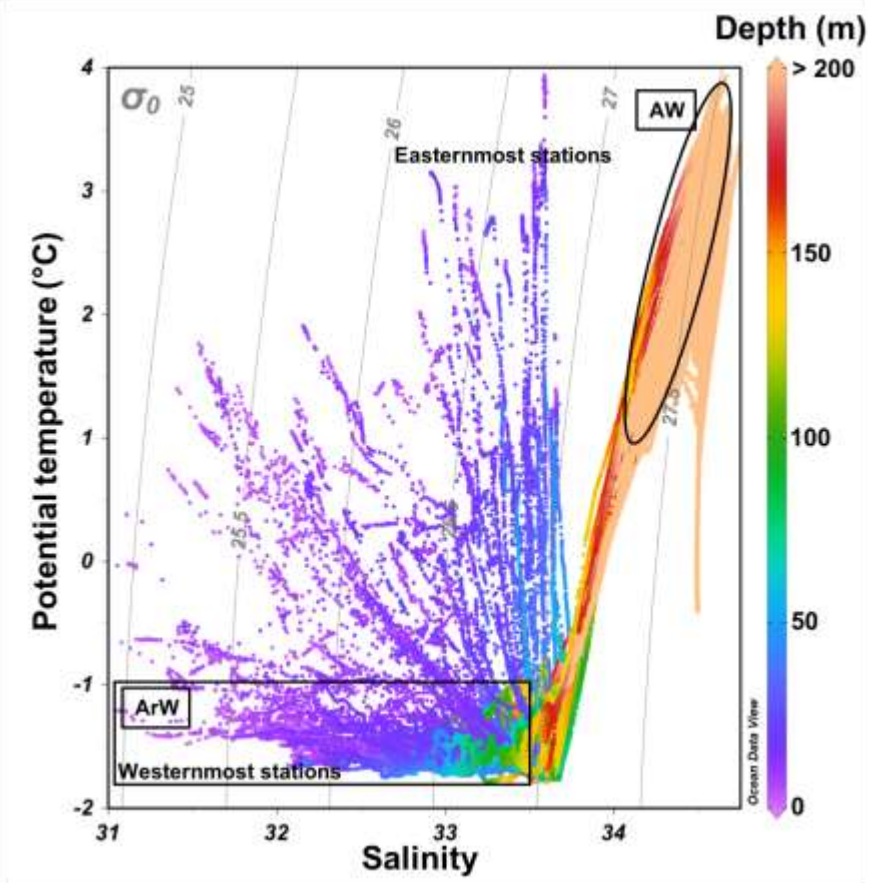


**Figure S2. T-S diagram for all of the stations**

Grey lines represent the isopycnal lines. According to the water masses defined by Tang et al. (2004) and modified by Randelhoff et al. (2019), we identify the Arctic waters (ArW) by T < –1°C and S < 33.5 g $kg^{-1}$, and the Atlantic waters (AW) by T > 1°C and S > 34 g $kg^{-1}$. In ArW, we calculated an ANP signature > 20 % (up to 60%), whereas in AW, ANP < 10%. The T-S diagrams are clearly different between the westernmost and easternmost stations, especially in the first 50 m, showing the west–east gradient in water masses.

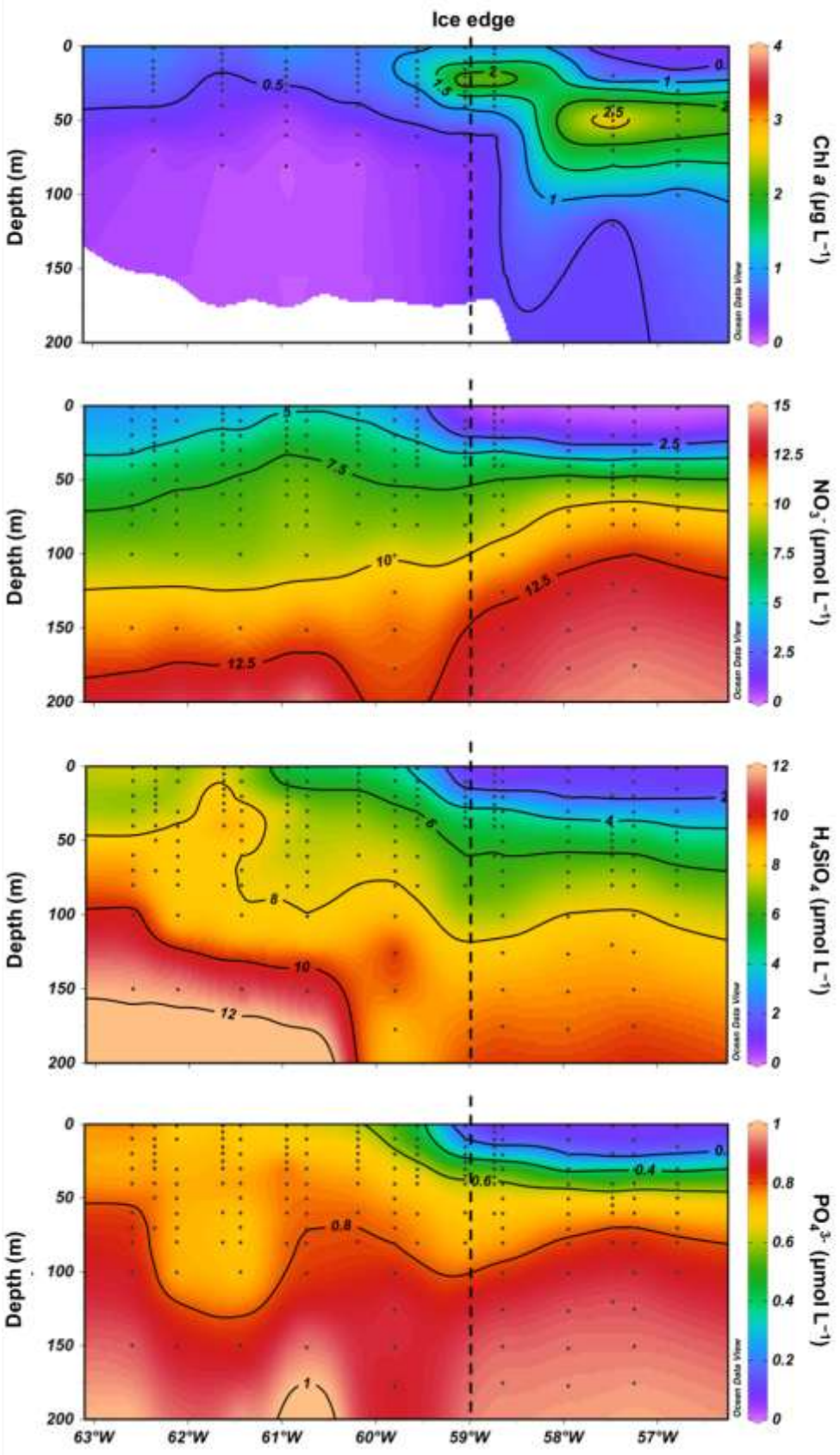


**Figure S3. Vertical distribution of concentrations of chlorophyll *a* and nutrients for transect T3**

Transect T3 is shown, as it well represents nutrient distributions (nitrate, orthosilicic acid, and phosphate) observed on other transects. The vertical dashed line at 59°W corresponds to the location of the ice edge (SIC = 0.5).

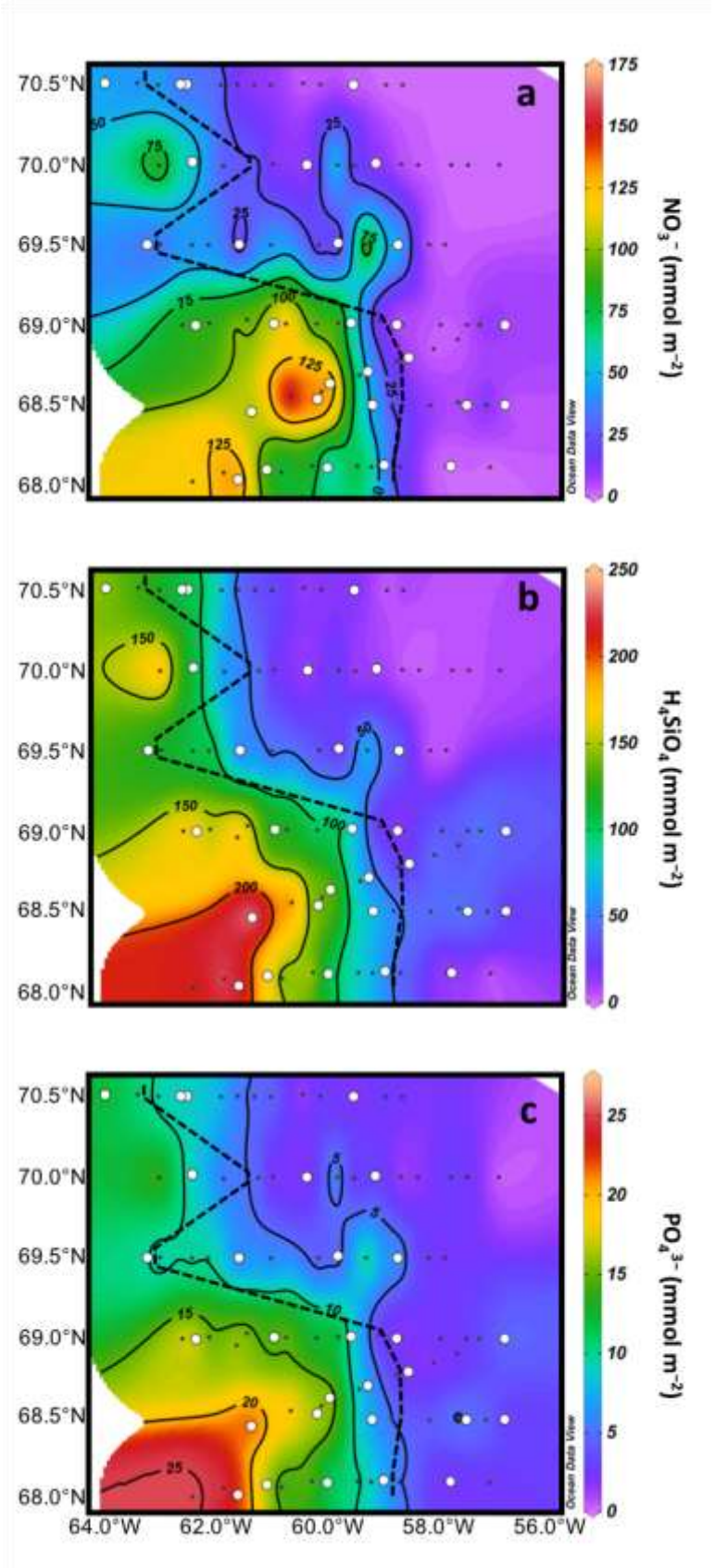


**Figure S4. Integrated nutrient concentrations over the depth of the equivalent mixed layer (hBD)**

The following nutrient concentrations are presented: nitrate (a), orthosilicic acid (b), and phosphate (c). The dashed black lines correspond to the ice edge (SIC = 0.5).

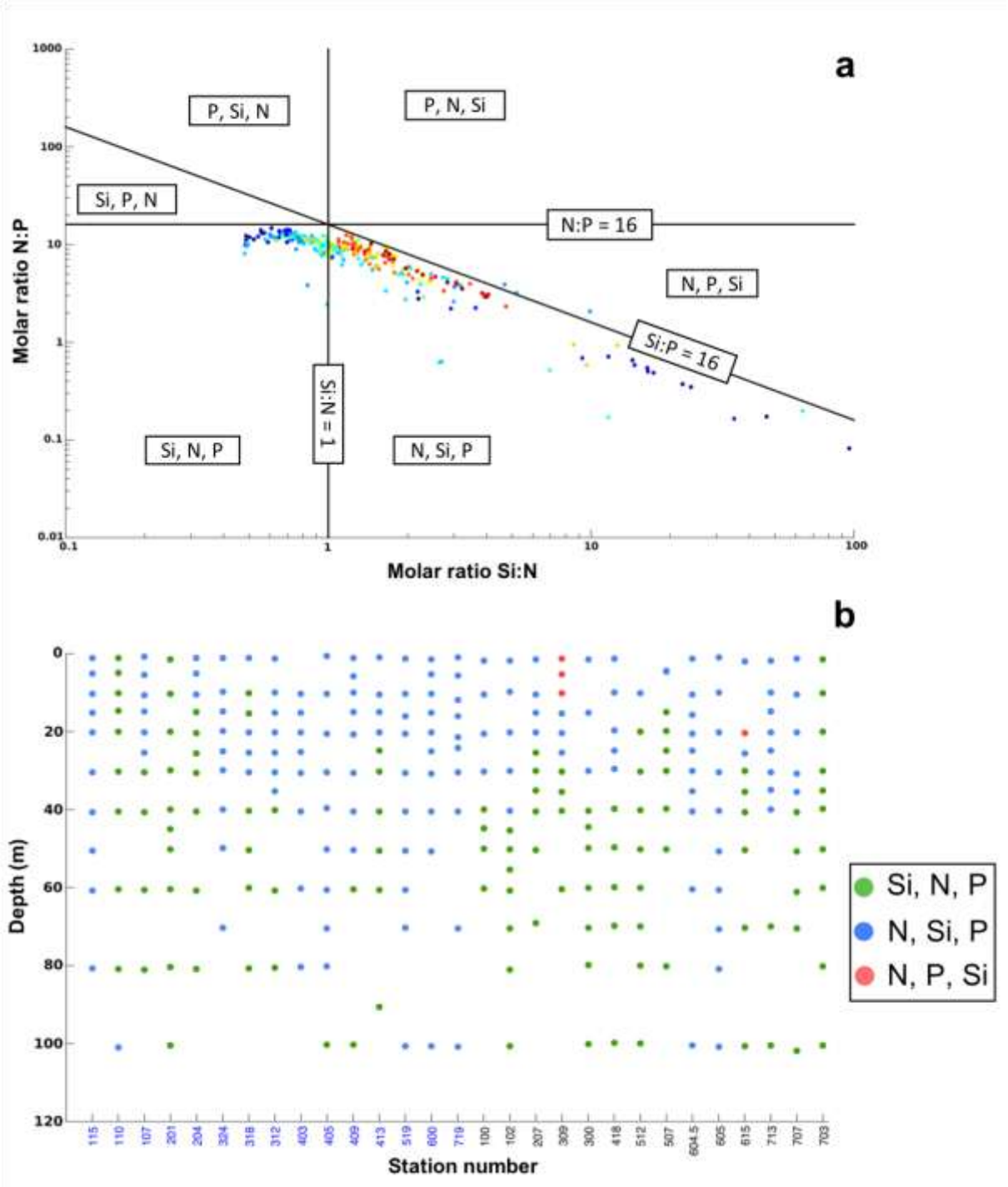


**Figure S5. Potential limiting nutrients in rank order (most limiting first) based on nutrient ratios**

a) Si:N:P molar ratios for all data collected between the surface and 120-m depth. In each area, as delimited by the Redfield et al. (1963) and Brzezinski (1985) ratios (Si:N:P = 16:16:1), the potential limiting nutrients are reported in rank order, with the most limiting nutrient listed first. Data points are colored according to station longitude, with blue circles corresponding to easternmost stations and red circles to westernmost stations. (b) Synthesis depiction by depth and station of the potential limiting nutrients color-coded to indicate rank order (see inset box). The station numbers for ice-covered locations are indicated in blue on the bottom axis.

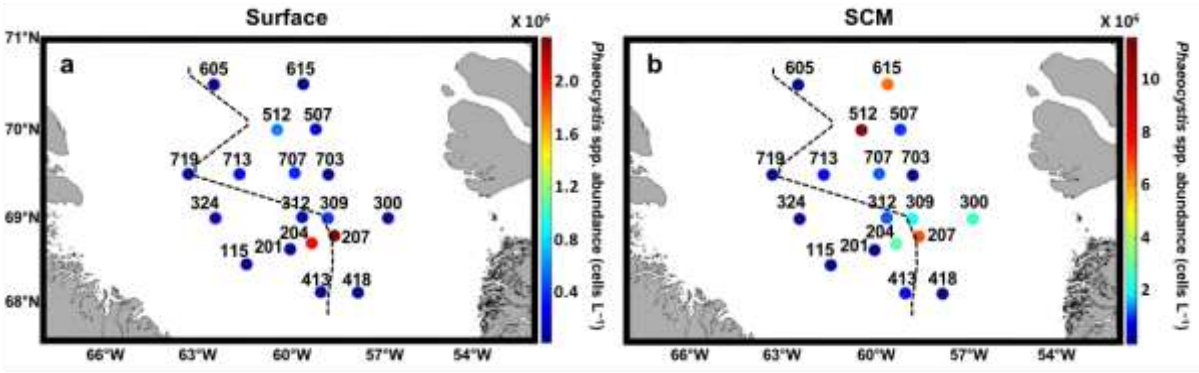


**Figure S6. Abundance of *Phaeocystis* spp. in surface waters and at the subsurface chlorophyll *a* maximum**

Color-coded abundance of *Phaeocystis* spp. in surface waters (a) and at the subsurface chlorophyll *a* maximum (SCM) (b). The dashed black lines indicate the ice edge (SIC = 0.5).

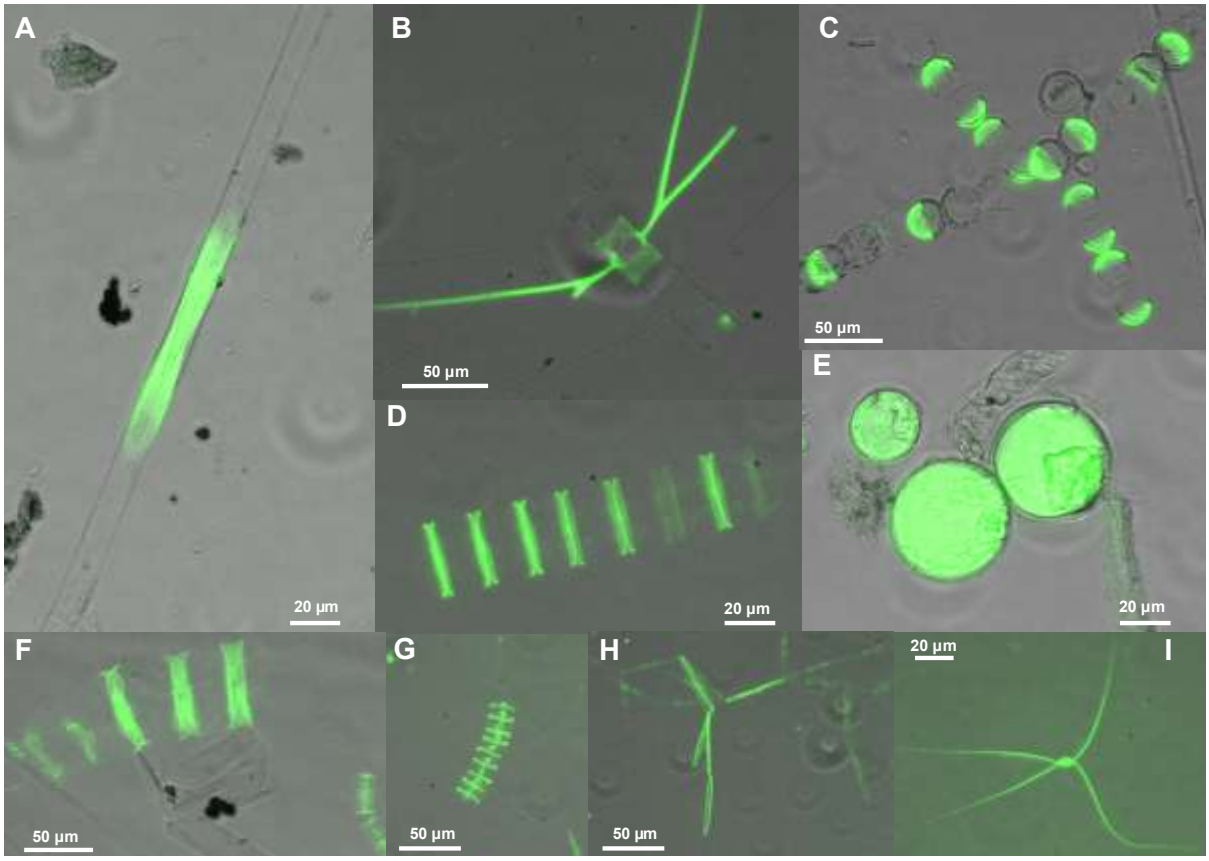


**Figure S7. Examples of actively silicifying diatoms labelled with the fluorescent dye PDMPO**

Micrographs are composites of epifluorescent and light microscopy images. (A) *Rhizosolenia hebetata var. semispina*, (B) *Chaetoceros decipiens*, (C) *Melosira arctica* spores, (D) *Navicula vanhoeffenii*, (E) *Thalassiosira antarctica var. borealis*, (F) *Entomoneis* sp., (G) *Fragilariopsis* sp., (H) *Nitzschia frigida*, and (I) *Chaetoceros* sp.

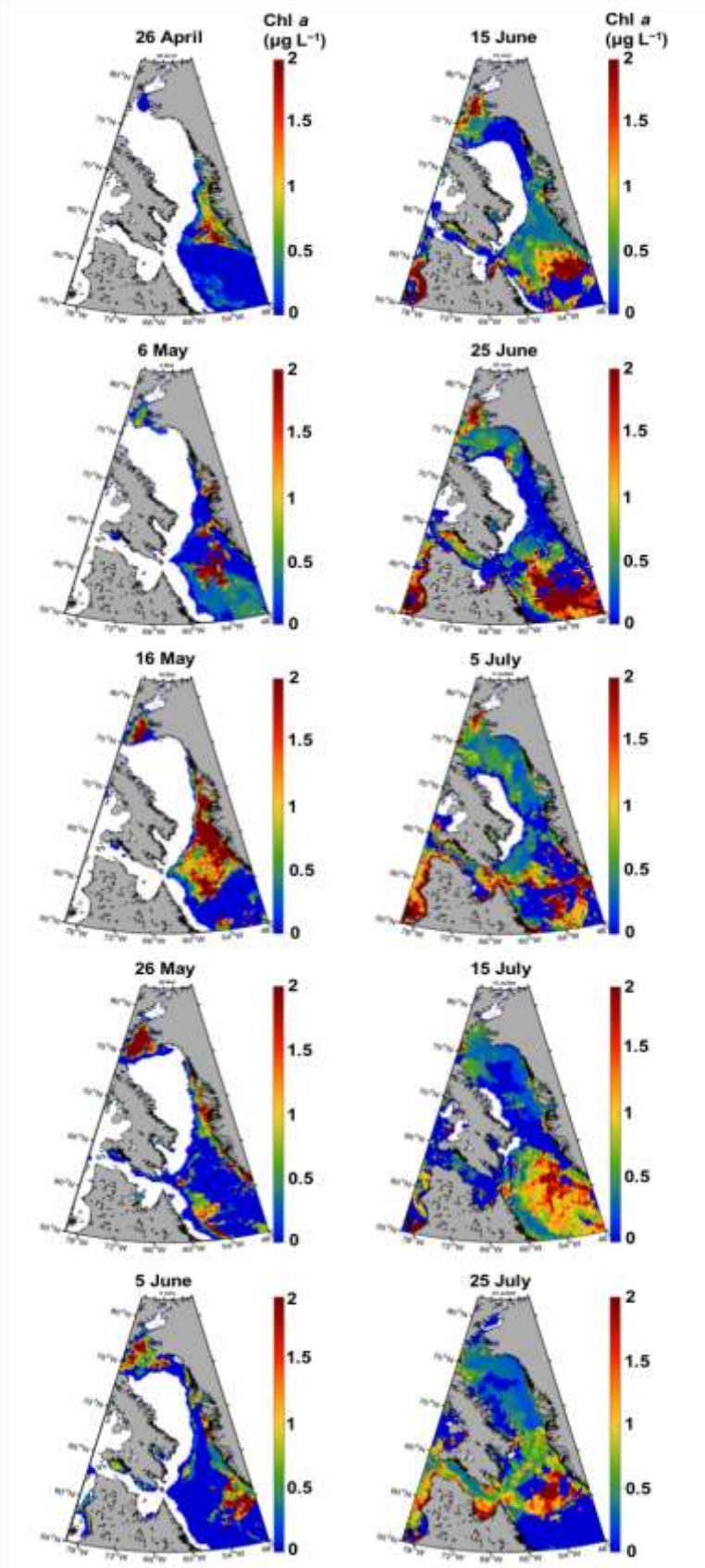


**Figure S8, Five-day composite images of satellite-derived surface chlorophyll *a* in Baffin Bay during April–August 2016**

The white area in these MODIS level 3 products corresponds to locations where sea ice concentration was > 0.5.

# References


Brzezinski MA. 1985. The Si:C:N ratio of marine diatoms: interspecific variability and the effect of some environmental variables. *J Phycol* **21**(3): 347–357. doi: 10.1111/j.0022-3646.1985.00347.x

Chevene F, Doleadec S, Chessel D. 1994. A fuzzy coding approach for the analysis of long-term ecological data. *Freshw Biol* **31**(3): 295–309. doi: 10.1111/j.1365-2427.1994.tb01742.x

Fragoso GM, Poulton AJ, Yashayaev IM, Head EJH, Johnsen G, Purdie DA. 2018. Diatom biogeography from the Labrador Sea revealed through a trait-based approach. *Front Mar Sci* **5**. doi: 10.3389/fmars.2018.00297

Krembs C, Eicken H, Deming JW. 2011. Exopolymer alteration of physical properties of sea ice and implications for ice habitability and biogeochemistry in a warmer Arctic. *Proc Natl Acad Sci* 108, 3653–3658. https://doi.org/10.1073/pnas.1100701108

Randelhoff A, Oziel L, Massicotte P, Bécu G, Galí M, Lacour L, Dumont D, Vladoiu A, Marec C, Bruyant F, et al. 2019. The evolution of light and vertical mixing across a phytoplankton ice-edge bloom. *Elem Sci Anth* **7**(1): 20. doi: 10.1525/elementa.357

Redfield AC, Ketchum BH, Richards FA. 1963. The influence of organisms on the composition of seawater. *The Sea*: 26–77. New York.

Spilling K, Markager S, 2008. Ecophysiological growth characteristics and modeling of the onset of the spring bloom in the Baltic Sea. *J Mar Syst* **73**: 323–337. https://doi.org/10.1016/j.jmarsys.2006.10.012

Tang CCL, Ross CK, Yao T, Petrie B, DeTracey BM, Dunlap E. 2004. The circulation, water masses and sea-ice of Baffin Bay. *Prog Oceanogr* **63**(4): 183–228. doi: 10.1016/j.pocean.2004.09.005